

In re: Matthew Donofrio
Application No.: 10/815,293
Filed: April 1, 2004
Page 6 of 9

REMARKS

Applicant appreciates the continued thorough examination of the present application that is reflected in the Official Action of November 22, 2006 (the "Official Action"). Applicant particularly appreciates the indication that Claims 27, 49 and 51 recite patentable subject matter, as well as the indication that the previous non-final rejections of the claims have been withdrawn.

Applicant has addressed the objections to the drawings. In addition, Applicant submits that the claims are patentable over the cited references, for at least the reasons explained below. Accordingly, Applicant respectfully requests reconsideration of the present application and allowance of pending Claims 1, 4-6, 12, 13, 17, 21, 23, 25-27 and 46-53. In addition, upon the allowance of Claim 1, Applicant respectfully requests rejoinder and allowance of previously withdrawn Claims 2, 3, 14, 16, and 18-20.

1. The Objections to the Drawings Have Been Overcome

The Official Action objected to the drawings under 37 CFR 1.83(a). In particular, the Official Action stated that the drawings must show every feature of the invention specified in the claims. With respect to a micro mask between the mask layer and the substrate, Applicant has amended Figures 9 and 10 as shown in the Replacement Sheet included herewith to show the micro mask 315 between the mask 310 and the substrate 100. Support for this amendment is found, for example, at page 15, lines 16-20 of the specification. No new matter has been added

2. The Claims Are Patentable Over the Cited References

Claims 1, 4, 12, 13 and 26 were rejected as anticipated by U.S. Patent No. 5,779,924 to Krames et al. ("Krames"). Applicant has amended Claim 1 to clarify that patterning the mask layer comprises applying laser light to the mask layer at an energy sufficient to remove material from the mask layer. This may be contrasted, for example, with embodiments in which laser light is applied to a material at an energy lower than an ablation threshold of the material.

The Official Action states that Krames teaches patterning a mask layer 5 on the semiconductor layer 1 using a laser to remove mask material. Office Action, p. 3.

In re: Matthew Donofrio
Application No.: 10/815,293
Filed: April 1, 2004
Page 7 of 9

However, Applicant respectfully submits that Krames teaches exposure of a mask layer using laser beam interference and subsequent development of the exposed mask layer, not removal of mask material using a laser as recited in Claim 1. See Krames, col. 7, ll. 11-23. Laser interference techniques are discussed in detail in U.S. Patent No. 6,410,348, which is of record in the present application. Krames also mentions photochemical etching using a laser at Col. 8, ll. 43-46 and "local laser melting and selective etching of melted regions" as mentioned at col. 7, ll. 25-32. Such processes may be distinguished from the direct laser ablation techniques taught in the present application, in which mask material is removed by a laser, as recited in Claim 1.

Accordingly, Applicant respectfully submits that Claim 1 is not anticipated by Krames. Claims 4, 12, 13, and 26 are patentable at least per the patentability of Claim 1.

Claims 46, 48, 50, 52 and 53 were rejected as unpatentable over Krames in view of EP 1263058 to Suehiro et al. ("Suehiro"). The Office Action states that Krames discloses patterning a mask on a substrate 3 using a laser to remove material from the mask layer 5. Office Action at 6. Claim 46 has also been amended to clarify that patterning the mask layer comprises applying laser light to the mask layer at an energy sufficient to remove material from the mask layer. As explained above, the laser techniques discussed by Krames include laser beam interference, photochemical etching, and local laser melting and selective etching of melted regions, and do not include the direct laser ablation techniques taught in the present application, in which mask material is removed by a laser, as recited in Claim 46. Suehiro does not provide, and is not cited to provide, the missing recitations.

Accordingly, Applicant respectfully submits that each and every recitation of Claim 46 is not disclosed by the combination of Krames and Suehiro, and that Claim 46 is therefore patentable over Krames and Suehiro. Claims 48, 50, 52 and 53 are patentable at least per the patentability of Claim 1.

Furthermore, Claim 50 recites forming a micro-mask between the mask layer and the silicon carbide substrate, the micro-mask being configured to roughen a surface of the substrate during etching. While Krames discloses applying a masking film before the photo-sensitive film, Krames expressly states that the masking film has a type and thickness selected "to achieve the necessary etch ratio between the

In re: Matthew Donofrio
Application No.: 10/815,293
Filed: April 1, 2004
Page 8 of 9

masking material and the device material in order to achieve deeply etched texturing which may be desirable for optimum light extraction." Krames, col. 7, ll. 35-39. In contrast, the micro-masking layer Claim 50 is recited as being configured to roughen a surface of the substrate.

Moreover, Krames expressly notes that the thin film (masking layer) "is a suitable transparent window layer which may be textured to improve light extraction into the ambient." Krames, col. 7, ll. 39-42. That is, Krames states that the thin film itself is textured to improve light extraction. In contrast, in the invention recited in Claim 50, the micro-mask is used to roughen the substrate.

With respect to Claims 52 and 53, Applicant respectfully disagrees that forming different three dimensional geometric patterns in a substrate is a mere design choice. As explained in the present specification, the three dimensional features may assist in the extraction of light from the chip. Since similar three dimensional features would tend to redirect light in similar patterns, providing different three dimensional features in a chip may help to change the direction of light emitted by the chip so as to provide a desired emission pattern, such as a more uniform emission pattern. Thus, contrary to the examiner's assertion, providing different three dimensional features in a chip does in fact make the device operate differently.

The remaining dependent claims are patentable at least per the patentability of the claims from which they respectively depend. In addition, many of the dependent claims provide separate bases for patentability.

For example, Claim 25 recites wherein patterning a mask layer on the semiconductor layer using a laser comprises patterning a master template with a laser and embossing the mask layer using the master template. Claim 25 was rejected as unpatentable over Krames in view of Laser Micromachining Article ("Boehlen"). Office Action, p. 6. The Office action states that Boehlen teaches patterning a master template with a laser and embossing a mask layer using the master template. *Id.* Applicant has studied Boehlen but can find no support for this assertion. While Boehlen discloses micromachining structures using a mask (e.g. the static mask in Boehlen Figure 1) through which a laser is directed, nowhere does Boehlen teach or suggest patterning a master template using a laser and then embossing a mask layer with the master template, as recited in Claim 25.

In re: Matthew Donofrio
Application No.: 10/815,293
Filed: April 1, 2004
Page 9 of 9

CONCLUSION

Applicant appreciates the continued thorough examination of the present application. Applicant respectfully submits, however, that the claims are neither anticipated by nor obvious in view of the cited reference(s). Accordingly, Applicant respectfully requests withdrawal of the outstanding rejections and allowance of the present application. In addition, upon the allowance of Claim 1, Applicant respectfully requests rejoinder and allowance of previously withdrawn Claims 2, 3, 14, 16, and 18-20.

The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,



David C. Hall
Registration No. 38,904

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer No. 20792

CERTIFICATION OF FACSIMILE TRANSMISSION UNDER 37 CFR § 1.8

I hereby certify that this correspondence is being facsimile transmitted to the U. S. Patent and Trademark Office via facsimile number 571-273-8300 on February 19, 2007 and is addressed to Mail Stop Amendment, Commissioner for Patents, P.O., Box 1450, Alexandria, VA 22313-1450.


Amelia Tauchen

Doc. 549050